Eos, Transactions, American Geophysical Union

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Afficas places were issued directly from their bot spot tracks and the selection of other places with respect to the bet spots were calculated from the respect to the bet spots were calculated from the cotions are finated from sealing reading date. The rotative cotion between assumed separate each Partille and south Partille (Conthess Size) places was estimated by essenting the het spots is the Atlanta Cosen bears been lixed with temport to these to the Partille Crean beain, thereby avoiding the use of a poorly-delined relative cotion rituit. We found that the thereteristics of early Tettiary place sociation with respect to the hot spots resemble those at present, the tost-recan-quare usfocity of every selective, but (atth the exception of the Indian place) is loss shen the exception of the Indian place) is loss shen the rotation of the Indian place is considered the first bed of the present. Our the hidden place beginning the subject of the present. Our the hidden place beginning the subject of the present. Our the indian place is loss the shedular velocities by only 0,04°/Ma, which is insignificant thus, and distinct approaches, Three-hot spots and on-net-lorque of the life opphyse, when applied to identified and in a prior lasting place velocities with the place velocities. We are subject to the control of the control of the place velocities and the place velocities and the approaches, Three-hot spots and on-net-avoid to place velocities. We attribute the different was staush here. For a poorly, place and only on the place velocities and on the place velocities and on the seal of the place velocities and on the place velocities. We attribute the different cases, botween these to reference freeze from Ideal and and cases. Sealed the sealed we should be able to the place velocities and the sealed was staush here. For a poorly of the place velocities and the sealed was shown here. For a poorly of the place were the place was a should here. Sealed the poorly of the place was a should here. Sealed the poorly of t J. Decphys. Res., S. Paper 430540 3150 Tectonophysics [Plate Tectonics]
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and Geographia, Cultivation, Barkeley,
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The Surman operators of blob-symbols and state for the Cal Horsts 34720)
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Tectonophysics

8150 flots tectonics GLORAL PLATE MOTION RELATIVE TO THE MOT SPOTS 64 TO 56

Donne M. Jurdy and Richeld O. Cordon Department of Geological Sciences, Sorthwestern Palversity, Eveneton, Illinois 65201)

Illinois 65201)
We examined the early Tertiery global place velotities with tempore to the hot spets, and compared these
velocities both to these at prosent, and to early
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African places were issured directly from Their bot
agor starks and the velocities of other butter with

Vol. 65, No. 17, Pages 321-336

Solar Physics,
Astrophysics,
and Astronomy

7799 General (Solar physics)
VERY LORG SOLAS PESICON AND THE RADIOCARDOS SCORD
G.F. Schatt (Dapt. of Piesetary Sciences and Lonar and Penaltary Laboratory, Univ. of Artisona, Tucson, Artisona, 85721)
Time veriations to the atmospheric radiocarbos record, espreased through the rebox-14 seaccurated in wood disclosus a maker of pariods in the interval from about 100 to several thousands of years. Though these are time variable, the statistics suggests their reality. These variable, the statistics suggests their reality. These variable, the statistics suggests their reality. These variable suggests the sum of the sum of the statistics of the sum of the sum

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Si 50 Piate tectoelts
THE distribution of NOT SPOTS
Michael Stefanick (Science Systems and Applications, inc., 10210 Oreembelt Road, Scabtoel, Maryland 20705).
Downs M. Jurdy
Not spots have an irregular distribution over the carth's autisee. Part of this irregularity is obviously due to the Simite musher (40-100) of bat apots, but the distribution does not appear to he completely reades. In this paper statistical coalgace are compared for two published bat apot data sate, one alleinal set of 42 and another larger catalogue of 117. Three approaches are takes: 1) thi-square tests of equal area boxes, 2) cumulative distributions about principal sase, and 3) recentrations of a decelty lustion. These methods all indicate their hot apots have a non-uniform distribution, even when statistical luctuations are sometismed. To the listed order, bet apots are tooccentrated on one-half the surface area of the sately within the portion, the distribution is to maintent with a uniform distribution. A prediction of het spot deseity is used bossed on an empirical model resisting number of hot spots to pleas apend. Cospatism of this predicted dessity functions for the two data sets yields some similatities; between, the abhaves but spot dessatify functions for the two data sets yields some similatities; between, the applained solaly by plate apend. (Not spore, statistics).

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Volcanology

9699 Volcanology
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Priorities for Solar and Space Physics

News

The Space Science Board's Committee on Solar and Space Physics is presently prepar-ing a report for NASA on the priurities for new space science programs in solar and pace physics, much as the Astronomy Survey (NAS-Field Report) and Solar-System Exploration Committees [NASA-SSEC Report) did for their respective disciplines.

This National Academy report is intended to define a program of space missions and as-sociated ground-based activities that NASA should undertake from now through the 1990's that will make substantial advances in our understanding of the physics of the sun and heliosphere, space plasmas, magneto-spheres of the earth and other planets, and the ionosphere and upper atmosphere of the

The study will build upon previous reports and studies as well as input from the community. Those wishing to offer suggestions, potential experiments, or advice should contact the Committee Chairman, S. M. Krimigis (Applied Physics Laboratory), or one of the discipline working group leaders: Solar and Heliospherie Physics, C. Withbroe (Center for Astrophysics); Space Physics, R. Fredericks (TRW); Atmospheric Science, D. Strobel (Naval Rescarch Laboratory). The Executive Secretary for the Committee is R. C. Hart,

The report is expected to be completed by

Thu news item was contributed by S. M. Krimigis of the Johns Hopkius University Applied Physics Laboratory in Lauvel, Ald.

Yamato 791197

A second meteorite of probable lunar ori-gin has been found among the several thousand meteorites recovered from Amarcica. It is number 791197 from the Yamato collection, which was recovered by an expedition from the Japanese Institute of Pular Research, Tokyo. The first mercorite of probable lunar origin (AL11A 81005) was identified by Brian Mason in 1982.

Some increorites may be leftover rock fragments from the nucleo-synthesis event that produced the snlar system. It is also believed that some meteorites are the result of other meteorite impacts on either the moon or on Mars and that these samples were ejected into earth orbit. However, it is not clear if these samples could have escaped the gravity on

Yamato 791197 is a 25.4 gm specimen that was described recently by K. Yanai and H. Kojima at the Ninth Symposium on Amarctic Meteorites, held March 22–24, 1984, in Tokyo. The surface of the meteorite is encrusted with glassy fused rock material, which apparendy is evidence of heating during its passage through the earth's atmosphere. Like ALHA 81005, this meteorite is classified as an impact breccia of anorthositic character. The chemical composition carries delinite evidence of its being from the muun. Ynmatu 791 197 is specifically different from other generally similar metenrite groups such as eucrites and howardites.

The ratio of MnO to FeO is a chnracteristic ingerprint of lunar material. Olivines and pyroxenes from die Yamato sample fall within the appropriate hunar range (approximately 1770).— PMB

U.S. Wetlands

Although the overall rate that the nation's wetlands are being converted to other uses is not alarming, the continued incremental conversion of wetlands, especially in certain inland regions of the country, may have signifise ecological effects over the next few decades. A comprehensive report on wetlands, requested by the Senate Committee on Environment and Public Works, was released recently by Senator John H. Chafee (R-R.I.), chairman of the Subcommittee on Environmental Pollution. The report outlines options for new federal measures that could lead to more effective management of wetlands in the United States.

Federal efforts to manage ivetlands could be more effective if they were focused on higher value wetlands, although, because the value of individual wetlands in different regions of the country have not been evaluated at this time, priorities for protection have not beeo established.

The Office of Technology Assessment (OTA) has called for the federal government o cominue or accelerate its ongoing mapping of werlands, concentrating on areas under the greatest development pressure. The next step, OTA says, involves categorizing wetlands according to their relative values by policymakers in cooperation with regional groups. In this way, existing wetland pro-grams can be more effectively focused on ligher value wellanda. OTA suggests that

21.4

Congress could also broaden the scope of existing wetland programs so that all of the natural values of wetlands are considered in cotzky, geochemistry, MIT; and Rebecca Anne Williams, geology, Johns Hopkins Unimanaging the various leasing, regulatory, and acquisition programs. At present, decisions about wetlands use are most often based on

single values, such as wildlife habitat. The U.S. Army Corps of Engineers' regulatory program, established by section 404 of the Clean Water Act, provides the major avenue of federal involvement in controlling wetland use by regulating discharges of dredged or fill material into wetlands. For Corps-regulated activities, annual conversions of wetlands were reduced by about 50,000 acres per

year, or 50% of the acreage applied for. Conversions of inland, freshwater wetlands for agricultural purposes have been responsi-ble for 80% of the wedand losses over the last 3 decades. Since the Corps' 404 program generally does not regulate these activities, 95% of the nation's wetlands, which are located in inland areas, are not well protected by regulatory programs. OTA notes that most coastal wetlands are reasonably well protected by a combination of section 404 and state

regulatory programs.

There are about 90 million acres of vegestated wetlands remaining in the lower 48 states, with an additional 200 million acres classified as wetlands in Alaska. Between the mid-1950's and the mid-1970's, the annual rate of conversion in the lower 48 states was about 550,000 acres a year. Because rates of agricultural drainage have declined, OTA estimates that annual conversions are now about 300,000 acres.-PMB

NSF Graduate **Fellowships**

Of the 540 college students offered fellow-ships by the National Science Foundation (NSF) this year for graduate study in 1984-1985 in the natural and social sciences, mathematics, and engineering, 34 plan to joursue graduate studies in the earth, ocean, or space sciences. In addition, of the 60 NSF Alinorit Graduate Fellowships awarded this year, 2 were offered to students who plan graduate studies in the earth, ocean, and space sci-

Each fellowship, awarded for 3 years of graduate study, provides a stipend of \$8,100 per year for full-time graduate study. An aumual cost-of-education allowance of \$4,900 is provided by NSF in lieu of all tnition and fees to the institution selected by each fellow for graduate study. The fellowships may be used over 5 years to permit students to incorporate teaching or research assistantships into their education thring periods in which they are not receiving their fellowship stipends.

In addition to the NSF Graduate Fellowship awards offered this year, 974 individuals who received fellowship awards in previous years are eligible to continue their study tlur-ing the 1981-1985 fellowship year.

Those strulents who were offered graduate fellowship awards this year to pursue graduate studies in earth, ocean, or space sciences are listed below with their proposed fields of study and the institutions chosen for gradu-

Ccoffrey Alexander Abers, geophysics, California Institute of Technology (CalTech); Ja-net Maria Becker, oceanography, University of California, San Diego; Paul Arthur Berkman, biological oceanography, University of Rhode Island; Sara Cooper Brothers, geology, University of New Mexico; Carol Jacque-line Bryan, geophysics, University of Califor-nia, Berkeley; Kelley Elaine Carlson, geophysics, University of Minnesota, Minneapolis; William Ward Chadwick, Jr.,

geology, University of California, Santa Bar-bara; Steven Cregory Crews, geology, Colora-do State University; Rebecca Jones Dorsey, geology, Cornell University; Mark Allen Fahnestock, geology, CalTech; Steven Scott Fine, Tanya Helen Furman, geology. Massachusetts Institute of Technology (MIT): John Patrick Clitner, geology, University of Texas, Austin; Robert Earl Crimm, Jr., geophysics, MIT; Kristine Holdened, biological oceanography. University of California, San Diego.

Samuel Warren Joffe, geophysics, Stanford University; Thomas Charles Juster, geology, University of Michigan; Meghan Willis Keith, geology, MIT; Michael Maier Keller, geogeophysics, Penesten Helbergies, Well-Leyenberg, Penesten Helbergies, Well-Leyenberg, Penesten Helbergies, Well-Leyenberg, Penesten Helbergies, Well-Leyenberg, Penesten Helberg, Penest chemistry, Princeton University; Kelly Lynn Kenison, oceanography, MIT; Walter Scott Klefer, geology, CalTech; Bradley Stewart Meyer, astronomy, University of Illinois, Chicago; Stephen David Murray, astronomy, University of California, Santa Cruz; Jacqueline C. Mutschler, geophysics, Cornell University; Jon Michael Nese, meteorology, Pennsylvania State University; Kirsten Peters, geology, Harvard University, Cynthia C. Pio-trowski, geochemistry, Cal Techi Laura Kathryn Reilly, geochemistry, Pennsylvania State University; Michael Perry Rupen, astronomy, Cal Tech; Daniel Badger Scaver, geology, University of California, Santa Barbara; Jonathan Edward Snow, geochemistry, University of Rochester, Michael Abram Strauss, astron-

The minority fellowships are awarded to minority students of outstanding ability. More than 520 students who are American Indian, Black, Pacific Islander, or Hispanic submitted applications to the nationivide competition. Ernest Austin Jones, Jr., will study geology at Harvard University. Lisa Diane White will study geology at Stanford University. In addition to the NSF Minority Graduate Fellowship awards offered this year, 106 individuals who received fellowship awards in previous years are ebgible to continue their study during the 1984-1985 fellowship year.—BTR

In Congress: **Upcoming Hearings**

The following hearings and markups have tentatively been scheduled for the coming weeks by the Senate and House of Representatives. Dates and times should be verified with the committee or subcommunitiee holding the hearing nr markup; all offires on Capitol Hill may be reached by telephooing 202-224-3121. For guidelines on contacting a member of Congress, sre AGU's Guide to Legislative Information and Contacts (Eos, April 17. 1984, p. 159].

May 81 Mark up of Landsat commercial-Ization bill (S. 2292) by the Senate Commerce, Science, and Transportation Commitiee. Russell Building, Room SR-253, 9:30 A.M. The House of Representatives passed its receion of the Landsat connuercialization bill 1H.R. 5155) 1Eos, April 17, 1984, p. 149) on April 9.

May 10: U.S. Geological Survey appropri-stions hearing for fiscal 1985 by the Interior and Related Agencies Subcommittee of the Senate Appropriations Committee. Dicksen Building, Room SD-138, 10 A.M.—BTR

Smithsonian Grants

The Smithsonian Institution has an nounced the deadlines for a fellowship in residence program and a firreign currency grants program.

The residence fellowships support independent research and study in helds that are actively pursued by the various bureaus of the institution. The primary objective of the fellowships is to further the research training of scholars and scientists in the early stages of their professional careers. Proposals will be considered for research, among other topics. in earth sciences; paleobiology; ecological, be-listional, and environmental studies of tropical and temperate zones; and history of science and technology.

Individuals are selected competitively and are appointed to work under the guidance of professional staff members and to use the nithsonian's collections and facilities. Preand post-doctoral appointments have a 6- to 12-month tenure; graduate student appointments are for 10 weeks.

Stipends supporting awards are \$18,000 per year plus allowances for postdoctoral fellows; \$11,000 per year plus allowances for predoctoral fellows; and \$2,000 for graduate students for the 10-week appointment.
Individuals interested in astrophysics or

geophysical research should write to the Smithsonian Astrophysical Observatory, 60 Carden Street, Cambridge, MA 02138. For general information and for information on other fellowships fields, contact the Smithsonian Institution Office of Fellowships and Crants, L'Enfant Plaza, Suite 3300, Washing ton, DC 20560 (telephone: 202-287-3271 or 202-287-3321). The application deadline is January 15, 1985.
The Smithsonian Foreign Currency Pro-

gram, a national research grants program, offers opportunities for support of research in Burma, New Guinea, India, and Pakistan in astrophysics, earth sciences, anthropology, archeology and related disciplines, systematic and environmental biology, and museum programs. .

Awards are determined based on compelltive scholarly review. Crants in the local currencies of the country where the research will be performed are awarded to American instiutions for the research of senior scientists. Collaborative porgrams Involving host country institutions are welcome.

For additional information, write to the Foreign Currency Program, Office of Fellow-ships and Crants, Smithsonian Institution. Washington, DC 20560 (telephone: 202-287-3321). The deadline is November 1, 1984.

Geophysicists

Philip H. Abelson, editor of Science, and Rep. Edward Boland, ranking member of the House Appropriations Committee and chair-man of its Subcommittee on HUD and Inde-

pendent Agencies, will receive the Distinwished Public Service Award of the National Science Foundation (NSF) at a dinner sponsored by the National Science Board on May 9. Abelson and Boland will be honored at a reception on May B as part of the NSF-spon-sored Science Week. Abelson has held numerous positions at the University of California at Berkeley, the Naval Research Laboratory, and the Carnegie Institution, which he headed as president from 1971 to 197B. He has been editor of the American Association for the Advancement of Science's weekly journal since 1962. Boland is a strong supporter of fundamental research, science and

mathematics education, and space sciences. Barbara Fillmore has been selected to receive the Association for Women Ceoscientists' National Officers Scholarship Award, which is presented to the outstanding woman geoscientist working in a degree program who has been an active participant in her profession and community. Fillmore is currently completing a masters of science degree

in geology at the Colorado School of Mines.

Don Kirkhom, a former professor of soil chemistry at Iowa State University, has been awarded the Wolf Prize for 1983-1981 from the Israeli-lased Wolf Foundation. The \$100,000 prize, which he is sharing with agronomist Cornells T. de Wit of Holland, is believed to be the largest prize for agricultur-

Ivan I. Mueller, has been appointed the chairman of the department of geodetic sciences and surveying at The Ohiu State University from October 1, 1981, though September 30, 1988. Mueller was elected first vice president of the International Association of Geodesy at the 1983 General Assembly of the International Union of Georlesy and Geophysics.

lu Memorian

The following AGU members are recently deceased.

Richard H. Jahus, 68, illed December 31, 1983. An AGU Fellow and a member of the Volcanology, Geochemistry, and Petrology section, he joined AGU in 1945. Sodami Matsushita, 64, ilied March 1-1.

1984. A member of the Sular-Planetary Relanonships section, he joined AGU in 1955. Kiyotoshi Misawa, 4a, dieil February 16, 1984. A member of the Sular-Planetary Relationships section, he joined AGU in 1969. Rocco S. Narcisi, 53, died March 27, 1984. A member of the Solar-Planetary Relationships section, he joined AGU in 1969. Duane C. Simpsan, 36, died Januari 14,

1984. A member of the Ocean Sciences section, he joined AGU in 1972.

Geophysical Events

This is a summary of SEAN Bulletin, 9(3), March 31, 1984, a publication of the Smithsonian Institu-tion's Scientific Ereot Alert Network. The complete bulletin is available in the microfiche edition of Ea as a microfiche supplement or as a paper reprint. For the microfiche, order document E84-004 at \$2.50 (U.S.) from AGU Fulfillment, 2000 Florida Atenue, N.W., Washington, DC 20009, For the pa per reprint, order SEAN Bulleton (giving volume and issue numbers and issue date) through AGU Sepa-rates at the above address; the price is \$3.50 for one copy of each issue number for Huse who do not have a deposit account, \$2 for those who do; additional copies of each issue number are \$1. Subscriptions to SEAN Bullatin are available from AGU Ful fillment at the above address; the price is \$18 for 12 monthly issues mailed to a U.S. address, \$28 if mailed elsewhere, and most be prepaid.

Volcanic Events

Mauna Los (Hawaii): Fissure eruption produces voluminous lava flows from NE rift vents; SO2-rich tropospheric plame reduces visibilities 7000 km away. Kilanea (Hawaii): Phases 16 and 17 include

strong fountaining, tephra, and the longest flow of the 1983-1984 eruption. Mt. St. Helens (Washington): New lobe truded onto the composite lara dome. Veniaminof (Alaska): Vapor plumes and incandescence.

Pavlof (Alaska): Vapor plume to 6 km alti-Nyanuragira (Zaire): Large lava finws and tephra ejection from flank hissure.

Campi Flegrel (Italy): More vigorous seismic-lty: uplift continues. Fernandina (Calapagos Is.): Caldera erup-tion; lava flow; SOs plume detected. Arenal (Costa Rica): 43rd---16th lava flows

aince 1968. Poás (Costa Rica): Fumarole temperatures de-

El Chichon (Mexico): Plumes on satellite images not caused by emptions.

Suwanosejima (Ryukyu Is.)ı Summary of activity, November 1982-january 1984. Submatine Volcanoes (Volcano 1s.): 1892-1983 observations. Sakurajima (Japan): Tephra causes minor damage. Rabaul (New Britain): Selsmicity continues to

News (cont. on p. 339)

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The Oceanography Report



The focal point for playwal, chemical, geological, and bu-

Editor: Arnold L. Gonlon, Lamont-Dolterty Geological Observatory, Palisades, NY 10004 (telephone 914-359-2900, ext. 325).

Information Report

Symposia on Chemical Oceanography

A continuing concern of the National Scienre Funnilation (NSF), the Office of Naval Research (ONR), and the National Oreania and Atmospheric Administration (NOAA) is the effective utilization of young scientists. To this end, these agencies are interested in becoming more familiar with the bleas being formulated by these individuals as they enter The held rsf occanography and independently pairsoe their research interests. It is also felt important that these new graduates be in possession not only of the most recent information on the research climate and opportunities in their respective fields, but are provided an insight into the structure, missions, and nucles of operation of the cosponsuring agencies of the sympasia, as well as the proce-dures to follow in seeking support to combet research from these agencies. As a result, the Marine Chemistry Program of NSF and the

Chemical Oceanography Program of ONS were extremely receptive to a suggestion made in October 1976 by E. D. Goldberg of the Scripps Institution of Oceanography that it would be irseful to have a symposium convened which would be completely dedicated to soon-to-be or recent Ph.D. graduates in chemical oceanography. After discussions at some considerable length with members of the scientific community, preparations were set in motion for ronvening soth a meeting,

which was anticipated to be the first in a se-Owing to the fact that the symposia were created for and are completely dedicated to the newest Ph.D.'s in chemical oceanography, certain general guidelines were formulated. First, major professors of the participants and their departmental heads and deans would not be invited to attend the meeting. The reason for this was that we did not wish to run the risk of creating any barrier to open and frank discussions of papers being presented or to risk achieving the goals of the meeting by its being taken over by these individuals. Second, participation was limited to ensure that each participant had antiple time to present his or her thesis research and that sufficient time was available for in-depth discussion and debate. Third, application to and selection for the meeting would be made on the basis of an exteurled abstract. These abstracts are to be printed in final form approximately I month after the close of the symposism, providing an opportunity for the authors to make any revisions as a consequence of the discussions that took place during the the rosponsoring agenries. Finally, time would be made available to the partiripants not only us initiate and hold informal ses-

It was felt that hy bringing together, it sclentific discussion and interaction, late stage chemical oreanugraphy doctoral cambidates. as well as new Ph.D.'s, professional relationships would be furger! which would facilitate future interdistiplinary and interinstitutional investigations. It was also considered that the entire incanographic community would become better aware of innovations in marine chemistry as a ronsequence of making young workers' efforts more visible. On the basis of the various types of tlata from the respective programs involved, these objectives have been realized, and it muy well prove to be rewarding to consider having similar symposia convened in the other subdisciplines compris-

sions, but also to address certain tupics raised

by the agencies at the repening session. The results of these informed sessions would be

presented by spokespersons of the groups

formed to address the assignments.

hig the Ocean Sciences. The first Dissertations Symposia on Chemical Oceanography (DISCO) was convened in

NOAA juined in ensponsoring the symposia, which have been convened at approximately provided in all instances by the American Institute of Birdogital Sciences (AIBS).

The lifth symposium was recently completed on March 9, 1984, and, again, was a complete success as viewed from both participants sponsors who attended. With the conclusion of this latest neeting, a total of 139 ing marine scientists representing 27 U.S. institutions have had the advantage of partiri-pathig in, and rereiring the benefits of, these symposia. In disrussing the desirability of continuing these inectings with the rommuni-ty at large, whirh obviously included former partiripants, the present enthusiasm is greater than at the beginning in 1978, and it is clear that these incetings are a community

During the period of these symposia, we have benchted from having 10 foreign participants, representing five countries (Belgium, France, Japan, Narway, and Pakistan). Travel for these participants has been provided by both their national resources and the Intergovernmental Oceanngraphic Commission (IOC) of UNESCO. Recently, the International Association for the Physical Sciences of the Ocean (LAPSO) has indicated that as an international scientific body they would be pleased to become associated with these meetings, and efforts have breat initiated to obtain resources from an international organization to support foreign participation, in addition to the national resources noted above. Indeed, it would seem that this series of symposia is proving to be of value well beyond that

The sixth DISCO is now being planned and is anticipated to be convened from Ottober 14 to 18, 1985. To be an invited speaker at the symposium, the applicant should have received his or her dortorate from an acrredited university after October 1984 or, alternatively, his or her departmental chairperson or rollege dean must rertify on the application form that in all prubability the applicant will receive his or her degree before July 31, 1986. The applicant's thesis must deal with an important problem in chemical oceanogra-

Potential partiripants are urged to note the dates of this meeting and be alert to a further announcement which will appear in the scientific literature and the posting of information concerning obtaining applications, which will be given wide distribution to appropriate graduate schools.

This Information Report was contributed by Neil R. Andersen, National Science Foundation, Washington, D.C. 20550, and Frank L. Herr, Offire of Naval Research, Washington, D.C.

News & Announcements

Research Ship Plans for 1985-1987

The University National Oceanographic Laboratory System (UNOLS), representing operators of Americao academir research ships, has established a National Expeditionary Planning Committee to roordinate planing of research ship cruises to remote areas. nulti-ship operations, and operations requiring fixed schedules of work. One essential part of this is to provide predictions of the areas in which the major research ships are likely to operate to make it possible for scientific investigators to do their own planning. This is, of course, a circular process: So marine sclentists have told us of their plans; these have resulted in tentative schedules. We plans into these schedules to use the skips more efficiently and to avoid unproductive

In the following list, ships are listed as working in their "normal operating area," ar-cas close to home part if there are not present plans for them in work elter-liere. Generallied routes are given for those sitins for which there are plans for remote operations. All plans are of course subject to change. Srientilic investigators interested in working on any of these slups should romact the ship-op-erating institution or the UNOLS offire (William I). Burlice, UNOLS Office WB-15. School of Oceanography, University of Washington, Seattle, WA 98196).

R/V Knorr (Wooils Hole): Normal uperating area (north and equatorial Atlantic) dur-ing summers of 1985 and 1986. Work in far south Atlattic floring winter of 1985-1986; may return north either through the Atlantic or the western Indian Ocean and Mediterranean. Time available for work en route in

R/V Melville (Scripps): Normal operating area (northeast and central Pacific) 1085 through November and summer of 1986,

February 1978, jointly supported by NSF and ONR. Subsequent to the first meeting.

Possible meridional transects to and from Antarctic along 100° and 170° west in early Antarcuc along 100° and 170° west in early 1986. Work in southern ocean (Atlantic am Pacific) in winter of 1986-1987, with transit runs either through eastern Pacific or south

R/V Allantis II (Woods Hole): Northeast Pacific in early 1985. Atlantis II will carry the DSRV Alvin through 1985; its schedule is therefore tied to the Alvin schedule, which is not yet firm beyond the end of 1984. Atlantic II will be equipped with a Sea8eam system

R/V Cound (Lamont): Will work in the equatorial Atlantir and Caribbean in early 1985, followed by East Pacific Rise work into San Diego by June. Transit to the western Pa-cifir (Philippines, Sonth China Sea) and Indi-an Ocean (north Australia) will be followed by availability in Indian Ocean or southern Indian-Atlantic ocean in late 1985 and early 1986. A tentative schedule for further work in the Indian Ocean during mid-1986 will await proposals. Coumd is principally outlitted for marine geophysical programs, with

Seagean and multirhannel seismic system. R/V Thomas Washington (Scripps): Starts 1985 in the south Atlantic; returns to eastern equatorial Pacific in May 1985. In fall-winter 985 will probably make a loop via Hawaii to the southwest Parifir, to southeast Pacific. May return north in early 1986 through southeast Pacific for north Pacific operation Will return south to Antarctir for the winter of 1986-1987. Equipped with ScaBeam; will carry two-channel digital seismic system for

R/V Thomas Thompson (University of Washington): Normal operating area (north Parific north of about 25° north). Will work to Japan and bark in 1985, has time available in the

R/V Moana Wave (Hawaii): Will start 1985 off the roast of Pern, work off western Somli America in early 1985, transit via Easter Island across the South Pacific to the Fiji area in mid-1985. Will work in the western and southwestern Parific through October and then proreed to the South Atlantic via either western South America or the Indian Ocean in November or Derember. Early 1986 will be spent in the southern oceans and a return to Honolulu via the Inilian Ocean and southwest Pacific is planned for the sommer and fall of 1986. Aloana Wave is being lengthened in 1984 and will rarry a multichannel iligital seismir system and SeaMARC II in addition to general laboratory areas and deep sea

trawl and hydrographic winches.

R/V Oceanus (Woods Hole): Normal operat-

ng area [North Atlanue]. R/V Endeavor (University of Rhode Islaml): Normal operating area (North Atlantic). In 1985 will work between Equator and Icelanil. In 1986 may work part of year in southeast

R/V Columbus Iselin (University of Miami): Normal operating area (western North Atlantic, Golf, and Caribbean

R/V Gyre (Texas A&M): Normal operating area (western North Atlantic, Gulf, and Ca-

R/V New Horizon (Scrlpps): Normal operat-ing area (castern north Pacific, California to R/V Wecoma (Oregon State University):

Normal operating area (northwest coast of United States). Will work south to Peru and back in March-April 1985. This news item was contributed by George Shor, Jr., Chairmon, UNOLS National Expedi-

tionory Planning Committee, University of Califor-

nia, San Diego, Scripps Institution of Oceanogra-

Symposium on Vertical Motion

phy. La Jolla, CA 92093.

A Symposium on Vertical Motion in the Equatorial Upper Ocean and Its Effects Upon Living Resources and the Atmosphere is to be held May 6-10, 1986, in Paris, France. This multidisciplinary international

symposium will address vertical motion in the constorial apper orean by bringing together leading researchers in occanography, meteoridigy, and lisheries. Papers are invited within the following topics: (1) generation, maintename, and dissipation preclamisms of veniral motion; (2) relationship between change in vertical mution and upper ocean heat content, sea sorface temperature, and atmospheric planetary buundary layer variations (3) instrumentation, observational techniques. and data analysis methods; (4) relationship between vertical mution and matrieut enrich ment, biological productivity, and lisheries yield; (a) constal upwelling in low-latitude regious; (ti) the role of vertical motion in the 1982-1983 Fl Niño Southern Oscillation event; and (7) the relationship between venical motion and the distribution of chemical

This symposium is organized by the Scientilie Committee on Oceanic Research (SCOR) Working Group 56 and is cosponsored by the Intergovernmental Oceanographic Commission (IOC), SCOR/IOU Committee on Clinatie Changes and the Ctrean (CCCX)), and Disision of Marine Sciences of the UN Education al. Scientific, and Cultural Organization (UNESCO). Members of the Symposium Organizing Committee are D. Halpern (Chairman), United States; R. Barber, United States; O. Goillen, Pern; D. Ho, People's Republic of China; R. Jimenez, Ecuador; A. Longhurst, Canada; H. Rotschi, Ivory Coast, and B. Voltteriez, France. The language of the Symposium will be English.

Cirrular Number 1 was issued in March 1984, in which abstract, registration, and general information about the symposium is provided, can be ulttained by writing to David Halpern, NOAA PMEL, 7600 Sand Point Way NE, Scattle, WA 98115.

The Pacific and Its Influence

A specially equipped scientific research ship and an Ormo 153 instrumented aircraft will be dispatched to the equatorial Patific Orean this spring by the National Oceanic and Atmospheric Administration (Nt)AA) to conduct in-tandem studies of the ocean's influence on, and relationship with, the amosphere. The NOAA ship Researcher will ruise the waters from Honolobi to Tahin between May 14 and June 1, taking water and air measurements while the Orion aircraft same ples the atmosphere overhead. After 3 weeks of data collection, scientists hope to gain new kitowlerlge almut how the ocean is involved in surh phemomena as acid min, El Niño, and

the "greenlunge" latilday at rarbon dioxide. The project will support a series of fire interboking scientific experiments. To try and answer the question of why rain acidity often as high in the remote orean as it is in some constal areas, one of these experiment will investigate romcentrations of sulfur and other chemicals in the water column and at the atmosphere's honnilary with the ocean-Another experiment deals with rarbon dioxule and how it is transferred at the air-sea in terface, a step in trying to understand the global "greenlumse" ellect that Is believed to

e warming up the cattle's dimate. Two tuore studies will gather that on trade winds in the equatorial zince and on the lurbulent applicates and throughouts that transfer heat across the air-water boundary. The fifth experiment is an investigation of the thermocline boundary layer that separates cold, oxy gen-poor waters from the warmer waters

These last two investigations will also feed data into NOAA's molti-year EPOCS (Equatorial Pacific Ocean Climate Studies) program, a broad effort by climatologists to understand the variation of sea surface temperatures in the tropical Pacific from season to season and from year to year. The hope is al climate patterns and how they are occasionally disrupted by events such as last rear's

NEW FROM AGU

Magnetic Reconnection in Space and Laboratory Plasmas (1984) Geophysical Monograph Volume 30

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News (cont. from p. 337)

intensify; deeper, stronger earthquakes; 2 seismic rrises. Manam (Bismarrk Seal: Strombolian jets,

gimeing avalanches, scoria llows. Laugila (New Britain): Activity low; explosions at middle and end of month. Ulawon (New Britain): Explusions and January seismic crisis 3-month sommary.

Bagana (Solomon Is.): Somuls, glow, tephra emissions; but no new lava flows. Atmospheric Effects: Accusols persist at midlautoiles; sonset reports.

Maona Loa Volcaoo, Hawaii (19.47°N, 135.61°W). All times are local (= UT-10 The fullowing textept for the plume datal

is from the USGS Hawaiian Volcann Observatory. Times noted below are preliminary and subject to slight revision ofter later analy sis. The USGS will provide a more detailed report of the eruption for a future issue of

A flank erupion began on March 25 and had ended by April 15. Simultaneous crup-tions on March 30 at Mauna Loa, Kilanca, Mt. St. Helens, and Veniaminof make this the first date known on which four U.S. volranoes were empting at the same time.

Summit inflation had continued since Manna Loa's last eruption July 5-6, 197% Baserl on an increase in the rate of geodetic change and seismic artivity, Decker et al. (Em, September 13, 1983) called attention to the "increased probability of a Mauna Loa eruption within the next 2 years."

There was almost no short-term instrumental warning of the eruption. Seismic activity had been increasing gradually through Marrli, but only 29 microearthquakes were recorded beneath the sommit raiders in the 24 hours before die eruption (in contrast to 700 microearthquakes per day in September 1983). At 2255 on March 24, a small earthquake swarm began directly beneath the summit and weak harmonir tremor was recorded from the summit station at 2330. Trenter aniplitude and the number of earthquakes inrreased about midnight, and burehole illuneters recorded the onset of rapid summit infla-

A military satellite detected a "strong" infrared signal from the summit in 0125, and glow was sighted from the ground 4 min later. Lava l'ountaining hegan in the calilera amb upper southwest rift, but eruption fissures had migrated flown the northeast rift before plawn. All plikes were emplaced within the lirst 15 hours of the emption, at propagation rates that varied from 2500 m/hour down the SW rift zone to about 1200 m/hour in lower parts of the NE rift zone (Figure 1).

By March 26 all lava production was conrentrated along a 500-m fissure segment near 2900 m altitude, about 15 km NE of the summit area (Figure 2). Approximately 80% of the lava production fed flow 1, which moved rapidly northeast toward Hilo March 27-28 (Figure 3). Significant advance of the front of flow I stopped by early March 29, more than kin from the nearest homes, although production at the vents remained essentially constant. When weather cleared March 30, a new branch flow (1A) was advanring quirkly N of flow I, but it slowed the next tlay as it thickened and widened upstream and the feeding rhannel became sluggish. Slow advance 1110inued until April 5, when a major overflow at about 2000 in abitude shin off most of its lava supply and fed a fast-moving flow (1B) Lava production decreased by about 50% doring the nights of April 8-9 and subsequent activity fed flows that did not mure far downslope. The rate of outflow gradually decreased and the emption had ended by early

The eruption produced a large gas plume that was rarried thousands of kilometers to the W by trade winds. There was no evidence that the plome rearhed the stratosphere. By March 30, a haze layer was ilejected at Wake and Johnston Islands (1400 and 3900 km from Mauna Loa) and had reached Guant (6300 km to the WSW) by Antil 2, SOr emitted by Manna Loa was detected by the TOMS instrument on the Nimbus 7 padar orbiting satellite, which passed over Hawaii daily at about loral moon. From the TOMS data, preiminary estimates of the total SO2 in the Mauna Loa plume were roughly 130,000 metric tons on March 26 and 190,000 tons on

The 1984 basalt was very fine-grained with widely stattered (<<1%) phenocrysts of olivine (most Fo 88-90) and sparse mirrophenorrysts of plagioclase and clinopyroxene. Maximum temperatures determined repeatedly by thermocraple and radiometer ranged from

The Weekly Newspaper of Graphysics

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Cover. Magnetic rerontection is a process, important in systems of inagnetized nas, by which differently directed field lines link up, allowing topological changes of the magnetic field to occur, determining patterns of plasma flow, and resulting in conversion of magnetic energy to kinetic and thermal energy of the plasma. The cover figure demonstrates quite similar consequences of magnetic recon-nection that are found in the vastly different environments of a comet, earth's magnetosphere, and a laboratory fusion experiment. (Top) Yerkes Observatory photographs of Comet Morehouse before and after its plasma tail was severed by magnetic reconnection near the comet's head in what is called a "disconnection event" (DE). A comet's plasma tail is created by an accumulation of solar wind magnetle field lines that drape around the comet's head. In a DE, the solar wind plasma and energy that have been stored gradually in the tail during its generation are suddenly released and returned to the solar wind. (Middle) The plasma sheet (shaded) in the tail of earth's magnetosphere is suddenly severed near the earth y magnetic reconnection. This creates a plasmoid (a system of closed magnetic loops) that flows rapidly away through the

tall, carrying a vast amount of plasma and

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energy earlier acquired from the solar wind. Such episodes of plasmoid generation and release to the solar wind were dramatically confirmed by ISEE 3 satellite observations at 1.4 million kilometers from earth and are thought to be the underlying physical process in magn spheric substorms. (8ottom) Axial cross section of the field-reversed θ-plnch experiment, FRX-C/T at the Los Alamos Nntional Laboratory, showing translation of a field reversed configuration (FRC) from the left servion of the cylindrical contain-er, where it was formed, into the "drift tube" section at right. The FRC (shaded), a cylindrical plasmoid, was formed near Z = 0 m by magnetic reronnection when an Initial B_2 (axial) field was entrapped in plasma and then compressed, at t = 0 µs, by a fast-rising B_s , field of opposite sign (by courtesy of D. J. Rej, Los Alamos National Laboratory). In the middle and bot-tom panels the lines with black arrows are magnetic field lines and white arrows indlcate the direction of plasma flow. (Further discussion of these phenomena can be found in Magnetic Reconnection to Space and Laboratory Plasmas, Geophysics Monograph Seniel, vol. 30, members \$23.10, nonmembers \$33.00; published by the American Geophysical Union (See Hones article this issue.)

- Eruptive ----- · Creck Zone gretion down SW Rift Zone Distance (km from 1940 cone)

Fig. 1. Rate of propagation of eruption lissures, shown as distance from the 1940 cone (in the SW part of the signing caldera; see Figure 2) versus time in hours after the start of

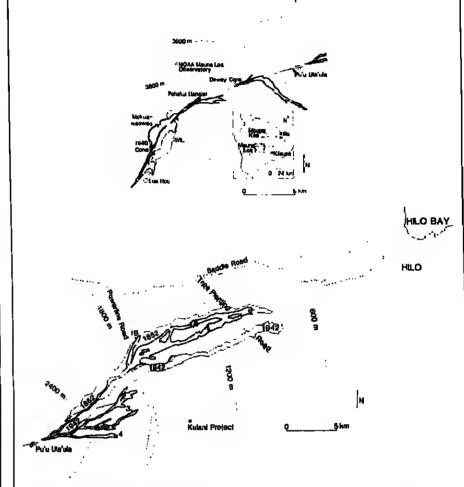


Fig. 2. Maps of the symmittarea and northeast rift zone of Manna Loa. Eruption lissores are indirated by hachned lines and 1984 lava flows are stippled. Contours are approximately 600 m apart. The edge of the suburbs of Hilo is shown by a doned line.

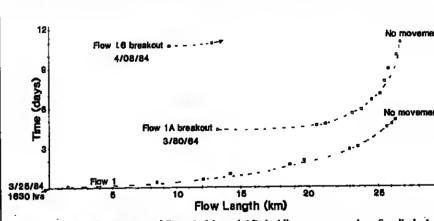


Fig. 3. Rate of movement of flows 1. 1A, and 1B, in kilometers per day. Small circles represent observations of flow positions.

Phase 17 of Kilanea's cast rift zone eruption began March 30 but had no apparent effect on Mauna Loa activity. Likewise, Kilauea tilt showed no deflection as the Mauna Loa

eruption began Merch 25.
Information Contacts: J. Lockwood and staff, USGS Hawalian Volcano Observatory Hawail Volcanoes National Park, H1 96718; J. M. Rhodes, Dept. of Geology, University of Massachusetts, Amherst, MA 01003; Michael Garcia, Dept. of Geology and Geophysics, University of Hawaii, Honolulu, 111 96822; Tom Casadevall, USGS Cascades Volcano Observatory, 5400 MacArthur Blvd., Vanconver, WA 98661; Arlin Kroeger, Code 963, NASA Goddard Space Flight Center, Green-belt, MD 20771; Michael Matson, NOAA/ NESDIS, Room 510 World Weather Bldg.,

Washington, DC 20233. Fernandina Caldera, Galabagos Islands (0,37°S, 91.55°W). All times are local (= UT-6

At 0500 on March 30, Oswaldo Chapi and Fausto Cepeda (of the Galapagos Nationni Park) heard noise from Fernandina Caldera, 22 km SW of their position at Tegns Cove.

Glow was visible over the NW end of the caldera, and a clood was seen Issuing from the same location after sumise. The eruption was described as being smaller than the Volcan Wolf erupilon of 1982 (see SEAN Bulletin,

The TOMS instrument in the Nimbus 7 polar orbiting satellite detected SO2 produced by the eruption April 1 and 2. No dain were avallable March 30-31, and SO2 had dropped below the detection threshold by April 3. Strongest values on April 1 were directly over the volcano, and a preliminary estimate of total SO, was 60,000 metric tons. No emption cloud was evident on NOAA weather satellite

imagery.
On the afternoon of April 4, the croise ship Snuta Cruz reported a long plume of vapor coming from the caldera, but apparently decreasing in size. They looked for glow over the volcano that night but reported none. On April 11, Fernandina was climbed from

the NW by David Day and L. Peterson, who reported an apparendy inactive lava flow

News (cont. on p. 340)

News (cont. frum p. 339)

reaching from the western airle of the caltlera (near the site of the major eruption of 1968) to the lake. At 0650 the next morning, Day and Peterson heurd a noise "like a large landdide" from their camp near the western caldera rim. Within 30 s, they reached the rim in time to see what Day described as a nuce ardente that had already moved from the vent area halfway to the lake. They left the rim, aml observers from Printa Espinoza, 17 km to the NE, described an eruptive cloud rising at 0655 to an estimated height of about 7 km. At 0704, Day and Peterson were nvertaken by an ash rain described as "raindrops with ash," and total darkness persisted until 0720. A thickness of 3 mm of lephra accumillated during that period at their nin camp. By 0725 it was clear enough to see into the caldera. Tephra covered the new lava un the caldera floor with the exception of an area a few hundred meters across in which molten

lava could be seen. Day and Peterson left the rim at 1030, and no further volcanism had been witnessed at the time of their radio report, at 1500 on April 13, from Punta Espin-

This is the sixth known eruption of Fernandina since the major explosive enuption and massive caldera collapse of 1968. The last cruption was not recognized in the Galápagos, but its pruducts are visible in an aerial phongraph isken March 26, 1982. From s 900-m-long circumferential fissure on the S rim of the caldera, flows moved both inward (N) down the caldera wall and over a high topographic bench, and outward (S) where the w ponded behind another row of circumferential vents. The eruption had not yet taken place when Tom Simkin and others passed this area on December 4, 1980.

Information Contacts: Gunther Reck, Director, Charles Darwin Research Station, Isla Santa Cruz, Galápagos Islands, Ecuador; Lucho Maldonado, Metropolitan Touring, P.O.

Box 2542, Avenida Amazonas 239, Quitn, Ecuador; David Day, Isla Santa Cinz, Galapugos Islands, Ecuador; Arlin Krueger, Cude 963, NASA Goddard Space Flight Center, Green-

helt, MD 20771; Michael Matson, NOAA/ NESDIS, Room 51D, World Weather Bldg. Washington, DC 20231.

Earthquakes

Date	Time, UT	Magnitude	Latitude	Longitude	Depth at Forns	Regium
March 5	0334	6.7 m _h 6.5 m _b 7.0 M _S 7.0 M _S 6.5 M _S	8.14°N	123.77°E	651 km	Mindinan, Philippine
March 6	0217		29.36°N	138.87°E	457 km	S of Housha, Japan
March 19	2029		40.28°N	60.34°E	80 km	Centrol Turkmen SS
March 24	0944		44.10°N	148.21°E	shallow	S Knull Islands
March 27	2007		4.58°S	145.70°E	12 km	Papun New Guinea

Meteoritic Events Information Contact: National Earthuptake Information Service, U.S. Geological Survey, Stop 967, Denver Federal Center, Bux 25016,

Firehalls: Czerhoslovakia; Italy; Portugal; Alaska, Hawati, Oregon, Pennsylvania, Tennessee, Washington, SF, USA.

Books

Magnetic Reconnection in Space and Laboratory Plasmas

E. W. Hones, Jr. Los Alanos National Laboratory, Los

AGU h publishing Mognetic Reconnection in Space and Laboratory Plannas, as volume 30 of

the Geophysical Monograph Series (members \$23.10; nonmembers \$33.00). This volume is based on the Chapman Conference on Magnetic Reconnection, which was held at the Los Alamos National Laboratory in October 1983. Organization of that conference was first considered in early 1981, at a time when the body of evidence for the occurrence and inportance of magnetic reconnection in earth's magnetosphere had already become impressive and was continuing to increase rapidly. There had not been a major conference on the subject since 1977, and the intervening

years had seen important new strides being made. Initial plans called for holding the conference in October 1982, but conflicts with other conferences forced its postponement for I year. The 1-year postponement unried out to be a blessing in disguise because it permitted major new magnetospheric observations, made during that year by the ISEE 3 satellite, to be reported at the conference.

Denver, CO 80225.

ISEE 3 was launched in 1978 into a halo orbit around the sunward Lagrangian point where for the next 4 years it served as a solar wind monitor. In late 1982 it was transferred

to earth urbit where, by means of lunar gravity assist maneuvers, it executed several trajectories through the far magnetotail reaching down-tail distances as great as 22th RE 11.4 x 100 km), about 3 times larther than systematic observations of the magnetotail had ever been maile before (see Eos, 64, 929, 1983). Data returned from that thistant tail location contained compelling new indications of the important role of magnetic reconnection in the magnetosphere. One of the most remarkable of these was the observation of large plasmoids (plasma structures threaded with

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NOW COMPLETE DIPPUSION J. W. Dungay

DEFINITION OF A SUBSTORM, PHYSICAL PROCESSES IN A SUBSTORM AND SOURCES OF DISCOMPORT

closed magnetic held loops) moving very rapidly flown the tail past the satellite fir association with magnetospheric substirms. The plasmoids are thought to be sectors of the magnetotail plasma sheet that have been severeil by magnetic reconnection occurring ugar the earth. That plassionls are created and released during substorms had been infregal previously from satellite data acquired much ploser to earth, so their artual phiervation with ISEE 3 constituted a most dramatic cunfirmation of that earlier idea. This phenumeron is riepicted on the cover of this issue of Eor along with illustrations of analogras effects of magnetic reconnection that are seen in comets and that are produced in laboratory fusion experiments. The identification of the passing plasmoids was made for ISEE 3 measurements of nurgretic fields, energetic particles, and plasma. These and other ISEE 3 observations were reported for the first time at the conference and are published

in de monagraph. This monngraph is, I believe, the lirst book dedicated entirely to the subject of magnetic

reconnection and thus should satisfy the present need for a convenient and thorough source of information and references. There is good balance between review papers, papers presenting the basic principles of magnetic reconnection, and papers describing re-cent abservational and theoretical advances. Although the book is weighted toward space plasma linerests (e.g., planetary magneto-spheres, conteis, solar flares) there are also freatments of reconnection in laboratory plasmus, particularly in fusion research devices where a unite different view (in the words of V. N. Vasyliunas, "a snue view") of magnetic

recunnection has traditionally been taken. Alout a clozen of the papers presented at the conference had been, or were soon to be, submitted to journals for publication. To ensure completeness of coverage of the conference subjects, extended abstracts of those papers, provided by the authors, have been in provided by the authors, have been in a provided by the authors are been are been an are been are been are been are been also an are been are be cluded in the monograph. Two other features of the book will, I think, helghten reader interest. First, questions and answers recorded after the talks are included in the

text. Second, the final half-day summary and appraisal session of the conference was taperecorded, and its transcript (with a minimum of necessary modification) is included as the last section of the book.

Finally, I am pleased that the book will serve to introduce to many of its readers the man who could appropriately be called the father of magnetic reconnection, the Australian physicist, Ronald G. Giovanelli. He was well known in the solar research community, but I feel that he probably was not known generally among magnetospheric and labora-tory plasma physicists. Ron Giovanelli suggested the importance of magnetic neutral points in three pioneering papers in 1946, 1947, and 1948 in which he advanced a new theory of solar flares. The subsequent development of the concept of magnetic reconnection evolved from those works. He was invit-ced to speak at the Los Alamos conference but could not attend because of a prolonged severs liness. Instead, he graciously sent me a video lape on which he presented the talk he

had wanted to deliver in person. The lape

was played fur the conference participants. and the talk is included in the monogra Unfortunately, Ronald Giovanelli finally Auccumbed to his long illness in January 1984 Edward W. Hones.

Ir., received his Ph.D. in physics from Duke University in 1982. After working 7 years in notclear reactor physics of the Argonne National Laboratory and the Savannah River Plant lie became interested in space research, which

he pursued at the Convair Corporation It San Diego, the Institute for Defense Analysis in Wahington, D.C., the University of Iowa and, since 1965, at the Los Alamot National Laboratory, His primary space research inter est has been the physics of the earth's magne tosphere. Using data from particle and plas-ina instruments developed by Los Alamos scientists for the Velassatellites and NASA's IMP.

6, 7, and 8 satellites he did pioneering sandies Classified relating geomagnetic and annural activity to the magnetosphere's dynamical behavior in the flowing solar wind. Those studies contributed importantly to the evolution of the presem solar wind-magnetosphere interaction theory in which magnetic recumection is a fundamental process. His magnetospheric studies continue through collaborations with

several scientific institutions, most recently

using improved observations with NASA's

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dered directly from the publisher; they are

Developments in Soil Alechanics and Foundation

Engineering, 1, Model Studies, P. K. Banerjee and R. Butterfield (Eds.), Applied Science, New York, xii + 266 pp., 1984, \$59.25.
Dictionary of Petrology, S. I. Tomkeieff; E. K. Walton, B. A. O. Randall, M. H. Battey, O.

Tomkeieff (Eds.), John Wiley, 680 pp.,

English-Russion Dictionory of Applied Geophysics, B. V. Gusev, N. N. Zefirov, A. S. Pelikhov,

I. K. Kupalov-Yaropolk, Pergamon, New York, x + 488 pp., 1984, \$50.

Explosive Volcanum: Inception, Evolution, and Howards, Studies in Geophysics, National Academy Press, Washington, D.C., xii +

Global Biogeochemical Sulphur Cycle: Scope 19, M. V. Ivanov and J. R. Freney (Eds.), John Wiley, New York, xiv + 470 pp., 1983,

ludex of Earth Resources: Observation Systems

(poster), compiled by C. S. Southworth, U.S. Geological Survey, Reston, Va., no

Laser Remote Sensing: Fundamentals and Appli-

York, xii + 510 pp., 1984, \$44.95.

cotions, R. M. Measures, John Wiley, New

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Alr Force Geophysics Laboratory Geophysics Scholar Program (1984–1988). The Air Force Geophysics Laboratory (AFGLI and The Southeastern Center for Electrical Engineering Education (SCEEE) announce that applications are invited for research appointments during the 1984–1989 year in the Geophysics Scholar Program. This program provides research opportunities of 10 to 12 months duration for selected Engineers and Scientists to perform research in residence at the AFGL, Hanstom AFB, near Boston, Massachuseus. Scholars will be selected primarily from such fields as Geophysics, Atmospheric Physics, Meteorology, Ion Chemitry, Applied Science, Mathematical Modeling using Computers, and Engineering.

To be eligible, camildates units have a Ph.D. or equivalent experience in an appropriate technical field. Some appointments may be confirmed prior to August 1984 so early applications are encouraged. All qualified application Deadline for September Appointments: August 1, 1984. For further information and application forms contact: SCEEE, 1101 Massachusett Avenue, St. Cloud, FL 32769 Telephone: (305) 892-6146.

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Pondoctoral Fellow in Atmospheric Science. A position will be available beginning October 1, 1984, at the Harvard-Smithtonian Center for Astrophysica. xv + 267 pp., 1984., \$22.50.

Proceedings of the Fifth Symposium on Polar Meteorology and Glaciology: Special Issue, No. 29, K. Kusunoki [Ed.), National Institute of Pofor theoretical analysis of the Shuttle glow and mod-ics of upper amosphere physics and chemistry. A Ph.D., which introduct research in aeronour, it reends, Send applications and manes of three rele-ences in: A. Dalgarito, Lenter for Astrophysics, 60 Garden Succi, Cambridge, MA 02139.

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 Excellent oral and written romittunications skills.

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Bauelle
Protect Management Division Project Management Division 505 King Avenue Columbus, Ohio 45201.

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Dr. Russell Metrill, Curmor and Manager of Science Services

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Southwest Research Institute/Ion Mass Spectrometry. A senior staff position is available in the Southwest Research Institute/Southwest Research applicant will have the opportunity to develop Ion mass spectrometers for spacecraft missions in the earth's magnetosphere as well as to come and planetary magnetospheres. The position requires significant experience in magnetic ion mass spectrometry and in microchannel-plate imaging detector systems. Contact 31.L. Burch. Southwest Research Institute, P.O. Drawer 98510, San Anuanio, TX 78284, telephone S12-684-5111, extension 2528, or Bill Cruttleit, Personnel Department, extension 2072.

Assistant Researcher/University of Hawaii. The Hawaii Institute of Geuphysics, Planetary Geosci-ruct Division is accepting applications for one to three positions, full-time, letteral funds, to begin between June 1, 1984 and January S1, 1985, for a period of one year, annually cenewable pending federal funding. DUTIES: The incumbent(s) will theyelop and utilize physical remote measurements of planetary surfaces and laboratory measurements of planetary surfaces and laboratory measurements of planetary surface and physical processes operating; and also evolution of planets, satellites, asteroids and comets. Emphasis is to be on optical spectroscopy and surface composition for asteroids, comets, Galilean satellites and serrest ial planets. The incumbent(s) is expected to devrlop an independent research programs. MINIMUM QUALIFICATIONS: Ph.D. in earth and planetary sciences or a closely related field; experience in sequisition, processing and Interpretation of multi-spectral and spectroscopic data; working knowledge of evolution and present state of the planets and of rock-forming minerals (including ites) and their optical properties. DESIR-ABLE: Experience with electro-optical instrument development and operation, large array continuer processing, spacerafi experiments and supervision of technical staff and graduate students. SALARY: Minimum \$20,208/annual; maximum \$50,500/annual. INQUIRIES: Applicants should send a cover letter describing qualification and experience with their vitae to Di. Thomas B. McCord, Planetary Geosciences Division, HIG, University of Hawaii, 2535 Corres Road, Honolulu, Hawaii 96822. CLOS-ING DATE: September 30, 1984.

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The Department of Geography/Geology at Eastern Illinois University is accepting applications for a temporary one year position in geology starting August 25, 1984. Chances are very gond that this position will become full-time tenure track. A Ph.D. is required. Rank will be at the assistant professor level. The candidate will be expected to trach physical or historical geology. Priference will be given to those candidates who ran teach one or more of the following: an introductory course in geophysics, economic minerals, structure, hydrology, and field geology. Other specialtics will definitely be considered. If the position becomes permanent, teaching at auminer field camp and the pursuit of research will be expected.

ered. If the position becomes permanent, teaching at summer field camp and the pursuit of research will be expected.

The Department has fix full time geologists and approximately 120 undergraduate geology majors.

APPLICATION PROCEDURES:

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(2) Individuals wishing to apply should inunediately make their interest known to:

Department of Geography and Geology Eastern Illinois University

Elarlevon, Illinois University

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(3) Candukates should submit the following materials to the above address as soon at possible:

all etter of application

by A current vita

c] Transcript from all institutions from where college credits have been essented dl Arrange for three letters of recommendation in present Send tames, attanceses, and telephone numbers of referees with letter of application. numbers of referees with letter of application.
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Ph.D.-Geochemist/Hydrogeologist, Research Planning Institute, Inc., a growing scientilla consulting company, will hire a geochemist/Hydrogeologist in work on terreturial and marine pollution projects starting 15 May 1984. Nrtessary skills include arong field reperience as well as knowledge of organic and netalik pollutants. Experience in pollutant in anspurt modeling highly desirable. Groot romain cation skills imperative, Send resume and examples of previous work, published papers, and so forth, to:

jacqueline Michel, Ph.D. Restareh Planning Institute, Inc. 925 Gervan Street Culumbia, SC 292DI

Paculty Position/University of Montana. The Geology Department of the University of Montana is inviting applications to fill a temporary, one-tear position at the Assistant Professor level (contract period will be from mid-September 1984 to early June 1985]. This position involves replacement of a faculty member on sabbastical leave. Ph.D. in geology is preferred; however, M.A.'s with teaching or professional experience will be considered. Students planning to complete their Doctorate during the 1984–85 academic year are encouraged to apply. Teaching responsibilities include undergraduate courses and introductory geology, mineralogy, petrology (sedimentary), and a seminar in area of special interest.

terest.

Those interested should send a letter of application, resume, three letters of recommendation to: Arnold J. Silverman, Chairman, Department of Geology, University of Montana, Missoula, MT 50812. The DEADLINE for applications is May 15, 1984.

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Faculty Position in Geophysics. Texas A&M Unireculty Postuon in Geophysics. Texas recombined the all course in the lail of 1984. This is a new postition and we will consider applications from outstanding candidates in any area of solid earth geophysics. Preference, however, will be given in candidates with backgrounds and interests in explination geophysics, particularly in electuical and magnetic methods. The Depan mem of Geophysics at Texas A&M currently has 17 faculty, 65 graduate anidents and 100 undergraduate students. The current faculty research emphasis is in the following areas: exploration geophysics, engineering geophysics, tectonophysics, internal earth structure, geutlynamics, and general geophysics. Geophysics maintains close contacts with the Orean Drilling Program and latends to participate actively in the Continental Scientific Drilling Program. The Depan ment has a VAX 11780 computer and has just moved into a new building.

new building.
Applicant should send their reaums and the names of direc references by June 1, 1984 to E. Hoskins, Department of Geophysics, Texas A&M. University, College Station, TX 77845.
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Postdoctoral in Field of Planetary Atmospherea, Start summer 84 for 12-month appointment, probably renewable, \$17,500. Preferred research in terests: upper aimorphere seronomy (exospherea), climate modeling, radiative transfer. Send vitae to: Porfessor J.W. Chamberlain, Space Phytics and Astronomy, Rice University, P.O. Box 1892, Houston, TX 77201. **Precision Tiltmeters For** Tectonics

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phasizing either A 15-0 data amayor at the property wind-planetary studies including adalished Property Venns data.

Applicants for these positions should possess the Ph.D. degree in a relevant great of physics, astronony, or planetary sciences. Some experience with data analysis desireable but not essential data analysis is desireable but not essential.

A resinue, copies all no mane than there publication in preprints and the names of three publication in preprints and the names of three references is small be sent to. Dr. Margaret G. Kivelson, Dr. Robert L. McPherrim or Ur. Chrinopher T. Russell, Institute of Gosphysics and Planetary Physics, DC1 A Tox Angelos 11A 10021.

The I never my of California encourages applications from qualified women and minorities.

Assistant Curator/Texas A&M Assistant Curator/Texas A&M
University. Assimant Curator, Ocean Brilling Program, Texas A&M University, to offere operations of ODP core repositionies, including calaloging and maintenance of collections, supervision of personnel, processing of sample requests according to ODDES/ODP sampling policy, and participation in drilling cruites. Massers of PhD in sedimentology, paleontology, or related area preferred. Send letter of application, resumm and maines of four referres to:

Dr. Russell Merrdl. Curmor and Mauager of Science Struces, Ocean Drilling Program P.O. Drawer GK College Station, Texas 77843 Application Oradline is June 1, 1984.

Research Associate in Geochemistry/Petsology.

The Department of Geology, University of Oregon, Invites applications for the position of Research Associate. Primary responsibilities will be to organize and obtain funding for independent research in geochemistry and petrology, and to supervise operations of the Oepartment's XRF laboratory.

Teaching advanced courses and supervision of graduate students is possible but not obligatory. Applicants must be familiar with modern analytical techniques, especially XRF, and should have a Ph.D. in one of the earth sciences.

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candidates should finyward their resume to: Professor O.N. Sikilar. Chairman, Search Committee, Depariment of Geological and Geophysical Sciences,
UV-Milwaukee, 1900 E. Kenwood Bird, Milwaukee, Wi 58211, with three letters of recommentation from professors and scientists well acquainted
with fire applicant's education background and research potentist. Closing date for applications is 21
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requirements for e Ph.D. degree or equivalent in merine geology, geophysics or a releted physical science or ecquired e minimum of three yeers of progressiv reeponsible profeedonel experience. At least one yeer of experience, comperable in difficulty end responsibility to the next lower level in the Federel Service, is required. Demonetreled research experience in e merine environment is preferred. Equivalent combinelions of professional experience end graduate education mey be accepteble. Interested persons should submit e recume or Stenderd Form 171, Personel

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University of Callfornia



Miloralogy/Department of Geology, University of Oregon. A position of Visiting Assistant Profraction of Geology will become acadinalism of September 15, 1984. The succeeding another as sometiments in the general field of nineralogy and crystallography and will be required to teach the one-year mineralogy rutures to geology majors. Tracking of use or more rourses in specialized areas of mineralogy is encouraged.

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AA, XRF, XRII, and a high-resolution X-ray emission spectrometer.

Applicants climid have a doctoral degree or have substantially completed the requirements for it before taking up the appointment. Send corriention sitae, bidingraphs, and statement of research interests, with names of three professional referees by May 15, 1981 to Chairman, Mineralogy Search Committee, Department of Geology, University of Oregon, Engene, Oregon 97403, Salary dependent on qualifications.

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AAAS Atmospheric and **Hydrospheric Sciences**

May 24-29, 1984 American Association for the Advancement of Science (AAAS) Aunual Meeting, New York, N. Y. (Bernire Ackerman, Secretary, Section W. P.O. Box 5050, Station A, Champaign, 1L 61820; tel.: 217-333-1702.)

Section W (Atmospheric and Hydrospheric Sciences) is sponsoring four sympoeia at the AAAS national meeting. On May 27 will be "El Niño and the Southern Oscillation." The topics on May 28 will be "Agricultural Production in Anomalous Weather Conditions" and "Is the Earth's Biota an Important Contributor to the Increase in COs in the Atmosphere?" The fourth symposium, on May 29, will discuss "The Sources of Radia portant Tree Species."

Arctic Science Conference

October 3-5, 1984 1984 Arctic Science Conference |35ili Alaska Science Conference), Anchorage, Alaska. Sponsor, AAAS Arctic Division. (John Davies, P.O. Box 80271, Fairbanks, AK 99708; tel.: 907-474-

Titles of abstracts ehould be submitted by June 1, 1984.

Abstracts are due July SO, 1984. (Titles and abstracts for the Meteorology and Oceanography Symposium should be sent to Stuart Bigler, National Weather Service, P.O. Box 2S, Anchorage, AK 99513; tel.: 907-271-

Papera ere invited on any area of northern science. There will be special seesions during the meeting on Vegetation, Inventory, and Mapping; Pure and Applied Mathematics; and a Special Program for High School Students. There will also be six symposia on the following topics: Science and Public Policy,

Watershed Management

April 30-May 1, 1085 Symposium on Watershed Management, Denver, Colo. Sprinsor: American Society of Civil Engincers. IE. Bruce Jones, President, Res Consultunis, Inc., P.O. Box Q, Fort Collins CO 80522.)

The ilcailline for submitting abstracts is June 10, 1084.

The theme for the meeting will be "Water stied Management in the '80's: New Directions" tions," and papers are solicited on topics rek vant to that theme. Suggested areas of conhydrology, modeling and simulation, hydrologic methods and processes, snow manage. ment, state-of-the-art appraisals, and water shed management case histories.

Ogallala Aquifer

June 5-6, 1984 Ogallala Symposium II. Lubbock, Tex. Sponsors: Texas Tech Univi sity Water Resourcea Cenler, Internation Center for Arid and Semt-Arid Land Studie Center for Arid and Semi-Arid Land Standard High Plains Underground Water Conternation District No. 1, Panhandle Underground Water Conservation District, Oklahoma Sate Univ. Div. of Agriculture, USGS (WRC, To. Univ. Div. of Agriculture, USGS (WRC, To. 2009), telescope of the University, Lubbock, TX 79409, telescope of the University o

as 1 ech of version will deal with recent and ies of the Ogaliala Aquifer, a vast under ground water formation underlying portion of eight states, and will also examine additional actions of the original and the states and will also examine additional actions and the states and will also examine additional actions and the states and the states are states. or eight states, and will also examine a varices in groundwater research in general varices in groundwater research in general Among the topics will be hydrologic and gold groundwater state in the hydrologic and gold contaminant sampling and transportation and contension, and adulter augmentation and conservation, and eling, economic factors, and aquifer development and decline. Speakers from the U.S. Departments of Agriculture and Interior, from state agencies, universities, and private engineering and consulting firms are scheduled to present technical papers.

Canadian Hydrology Symposium

June 10–12, 1984 Canadian Hydrology Symposium 1984, Quebec, Canada, Sponsor: National Research Council of Canada Associate Committee on Hydrology. 1H. R. White-ley, School of Engineering, University of Guelph, Guelph, Omario N1G 2W1, Cana-

The symposium will deal with the interaction between hydrological processes within watersheds and the substances that determine water quality. The study of substances transported by water, their sources, and the pathways along which they move, will be particularly emphasized. Specific topics scheduled for discussion include: sumomberic inputs and their impact on water quality; land use as a determinant of water quality; constituents and processes in urban runoff; water quality evolution in rivers, lakes, and reservoirs; overland runuff processes; aml the use of deteministic and stochastic hydrological models.

New Listings

June 25-27, 1984 Technology Transfer Society Ninth Annual Meeting and International Symposium, Boston, Mass. (Margaret McNamara or Jack Griffin, Naval Underwater Systems Center, New Lomlon, CT 06320; icl.: 203-440-4590 or -4116.)

July 22-2B, 1984 Eighth World Conference oo Earthquake Eoglneeriog, San Francisco. Sponsor: Earthquake Engineering Re-search Institute. (J. Penzin, Earthquake Engineering Research Institute, 262ti Telegraph Avc., Berkeley, CA 94704; tel.: 415-848-

August 26-29, 1984 Geothermal Resources Council Annual Meeting, Reno, Nev. (Geothermal Resources Council, P. O. Box 1850, Davis, CA 95617; tel.: 916-758-

September 28–29, 1984 Tectonic Geo-morphology—15th Annual Geomorphology Symposium, Binghamton, N.Y. Organizers, Marie Morisawa and John Hack. [Marie Mor-nawa, Dept. of Geological Sciences, SUNY, Binghamton, NY 13901; 1el.: 607-798-2615.)

October 16-18, 1984 Statistice Symposlum on National Energy Issues, Seaule, Wash. (Robert Kinnison, Statistics Section, Pacific Northwest Laboratory, P.O. Box 999,

AGU Membership Applications

Applications for membership have ben re-ceived from the following individuals. The letter after the name ilenotes the proposed primary section affiliation.

Gladees Abdypoor (T), Sampson A. Acheampong (H), M. M. Aral (H), Alan Bar-nett, Ulrich R. Christensen [T), Herbert A. Colien (SM), Balaram Dey (A), Augusto Ghetti (H), Thomas W. Giambelluca (H), William C. Keene (A).

Robert W. Lichty (H), Raymond Luebbers (A), Robert B. Lundahl (T), Kazno Makita (SM), Joel Marko (S), Edward C. Mozley, Hitonori Ono (H), A. M. Sereci (S), Edward H. Tenner, Leon Wittwer (SM), Toshitsugu Vamazaki (GP), Gonzalo A. Yanez Carrizo (GP).

Student Statue

G, D, Earle (SM), John Flinn (G), Yousef D. Gumati (T), Jeffrey W. Johnston (T), Thomas J. Kerr (G), Peter T. May (A), Jim E. O'Connor (H), Angelos Protopapae (H), Michael Ravine (P), J. Milo Robinson (G), Raylan H. Roetman (A), Jefferson R. Snider (A), Douglas K. Solomon (H), Harlan E. Spence (SM), David A. Wark (V), Stuart A. Weinstein IS), Carolyn M. Zehnder (S), Yuanchong Zhang (G).

Correction

In the article,"AGU Scholars," which appeared in the March 13, 1984, Issue of Eas (p. 101), the affiliation given for Charles R. Elerson was listed incorrectly. He is currendy enrolled at the University of Wisconsin-Milwau-

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Separates

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Planetology

CASA Interiors of planers
SEMUS BANDED TERRAIN. TECTORIC MODELS FOR SAND FORMATION
AND THRIS RELATIONSEFF TO LITHOSPESSET THERMAL STRUCTURE
SEAR C. Rolocom (Operateson to Earth, Armasphoric, and
Flanethery Releaces, Messanhassetts justicate of
Technology, Cambridge, Mans. 9(197) and James W. Mend
Bacant mader Lasges of the negotalmo of febter Terra,
Sanus, at approximately 1-he radar resolution show a
series of linear beads of sitemalively greater and
issuer backcoster; the boods are generally sifgeed with
the topographic eviels of the mountels ranges. We then
the the thing these hand fastuces are teaces of in
origin, the prodect of their of feiding during II thougher's
compression or of bloch fastiting during lithospheric
extension. Tested models for feiding include uniform
elastic and viscoss plates overlying forjeald substrates,
latered plates, and a viscoss hallepass in which
viscosity decreases exponentially with depth. The
ual lore plate models can produce foids at a dominot
uavalength equal to the characteristic spacing between
hands on Vanus, shour is to 60 hm, if the clausic or
bigh-riscosity later is at most a few hilometers in
thickness, though the tequired compressive extresses are
several kilobars in sagnitude, for the sease of an
exponentivity decreasing vicessity, the shin depth plays
(he sole of leyer thickness and similar results beid.
Layered aleastic or viscous spietes, however, can fold af
the required usvelough with sub-hiloter tresses, and
are sharefore favored over unilors plate models. Tested
untuational models lessing grahms and here irrestion in
a surface elastic-brittic layer, inbefrace normal
faulting, und nacking of a surficial layer that is
everywhere in a state of excessional failure. The
specing between adjacent extensional failure. The
specing models are successed and extensional facilities
of Venus countain respec at the image res of Venus countain ranges at the lease resolution presently available. Additional evidence, however, including the linearity and continuity of individual sends, the relationship between bend trands and topographic contuers in some regions near the ends of sountein ranges, and the very different monifestations nountain ranges, and the very different manifestations of lithospheric ariension in other highland areas of Venus, leads us to fevor the hypothesis that bended terrain fortund contemporenously with the countein ranges of letter Terre as a result of bottonets compression of the Yeaus lithosphese. Independent argonants on the thermal atructure of the Yeaus crue; and the rechenical behavior of crustal rooms as a function of temperature indicate that the slastic lithosphere of Yeaus in appealmently lithosphere that the supplication of the Yeaus crue that the supplication of the Yeaus crue of the supplication of the Yeaus of the the the supplication of the the thirty of the year of alastic-brittle or high-riscosity behavior required for either the tempressional or establishment of the Yeaus highlesde at the time of bend Cornation. Yeaus tertonise, banded terrain, elastic lithosphere)
J. Gaophyo. Res., 8, Fapar 480436

Seismology

SOLE Explosion Saismology
A COMPARISON OF VELOCITY AND ATTENUATION SETMEEN
INE SICOSAN AND EXECUTE SEA FASS
R.S. JANCOSSON (Callage of Ocrueogruphy, Dregen Stafa
University, Corvellis, Grugon 9731), G.G. Shor, Jr.,
Ilchai Bee
The comprussional wave volocity and oiteneation
measurements from in deep-nourca, deep rucefrur menismic
rafruction experiment from the Nicober Fan, Ledion
Goesan, may prusented and compared to a statist sai
of measurements in the Bengsi Fan. The two deep
sea fans consist of thick sections of furbidities,
derived from the same nediment source, but have
sitishily different deponitional historien. Transi
time invarsion of the date into a volocity depth model
was the leu-neta linear invarsion of the travel
invarsion for the date into a volocity depth model
was the leu-neta linear invarsion of the travel
invarsion process. Although the velocity sirurtares
with depth are morphologically similar, there
exist diacreta differences between the box sistions.
In the Sicober Fan, the initial velocity (ansumed)
is 1.513 km/s, sith an initial gradient of 2.32 sec⁻¹.
The velocity jecreanes smoothly with depth, while
the velocity gradient decreases rapidly to a constant
0.51 sec⁻¹. The Sengal fan station intowed the wase
trend, inflowing the velocity gradient at depth wan
only 0.57 nec⁻¹. The stempation prilling are inicially
only 1.57 nec⁻¹. The stempation prilling are misler
only 1.57 nec⁻¹. The stempation prilling are the stempation
of 0.1 being a factor of 3 to 4 lans then the Bengal
station. The differences in velocity and attension
of velocity, yeacity gradients, and together with
intrebed sultiples) stempation in thisk asdimentry
nections. (Attance of a normal lead in th

5950 Safamic Sources RFFECTS OF PRESIDENT PAULT PROPERTIES ON FRECTIONAL INSTABLETTES PRODUCED OF BINDLATED FAULTS P. G. Okubo (Onlead States Coological Survey, MS 977, 345 Middleffeld Boad, Maolo Perk, CA 94925) and J. H.

P. G. Okubo (Onlind States Geological Survey, NS 977, 345 Middisfield Dood, Heado Perk, CA 94325) and J. H. Distarich
Leboratory studies of large-scale studiated lacins show that physical properties of the fault, specifically occurs arraws and fault roughases, significantly tolluses the unchable sheer failure behavior of the Fault. In addition, the apparients provide ineights lote laportant length acalling effects that are saeful for assessing conseques such as critical crack length or rupture unclassion dimension. Sitch-slip sheer failures have been gaesrated along a 2-b-long simulated coult in a binch of Sieru white grants. Experiance were conducted at normal excesses between 0.5 and A Mya with two differest propered roughnesses of the smulated fault a swooth fault with a profilmenter hearured roughness of -20 ss. High-speed records of shear strains and alip solicities clearly show both the propagation of the stidi-sip failures and datais of the lotal delongation and estions from which propagation of the fault at the onest of aliding can he resolved. Both the dynable stress drops of the stick-slip sweets and the apparent learners overgies of the substitute of the Coelt slip weakering intrease with locknessing obtant arrain. Although tritical slip-weatening displacements are lossed fault roughness with the special particles are also larger, on the rough fault rham happerfaments are increased fault roughness with the special plate trians on the search fault is substituted by the search of the stock of all plate search of the fault at the ones of the stock of the stock of the search of the stock of the search of the coefficients are increased fault roughness with the sample fault research of the stock of the stock of the fault at the ones of the stock of the stock of the search of the stock of the search of the stock of the search of the stock of the stock of the search of the stock of the search of the stock of the stock of the search of the stock of the search of the stock of the stock of the stock of the stoc

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When a length scale based on rupture nucleation disensions, directly proportional to critical displacements, le introduced, the data suggest that at lauf longths closs to the nucleation lengths rupture velocity and allo velocity increase with introducing fault length. (Brick-silp, Frictional Insrellity)

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8953 Selecit Sources
MMMENT-MACHINUS RELATIONS IN THEORY AND PRACTICE
Thomse C. Hanke (U.S. Geological Survey, 348 Hiddfafield Road, Henlo Part, CA 34025] and Sevid M. Boors
The observation that motivaten this study is the diffarence in c-values in mement-megaired relections of
the fore log Mg. = CH, = d between central and Southern
californie. This difference is not at all related fo
gaographical snes; rether, it results free positive
curvature to the log Mg. = M, placen sed the relatively
large number of Mg. < S marthquakes in the tesfred Californie dates sat. With the prescription that the farfield shear saves from which Mg, in taban be finiteduration, band-lielted, white Guessiae coins in ecceleration, we can estimate M, no e function of Mg. clona,
by flaing the ergs stress drop at 105 bare and face at
18 Mt. These modef calculations fit swellable Cafifornie moment-magnitude date for S € Mg. € 7, IST 5 Ng
§ 10¹⁵ dyna-co with striling accoracy. This range in
course strength |s entire: sarthquakes with Mg. ≥ 10²⁸
dyna-ro are sed thely to escur in California, and ourthcastes with Mg. < S cannot be recorded in California, or
less the set of the control of the control

J. Geophys. Mas., B. Yapar 480432

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of the first Pairir RISE Divise 1: Ann 1:44
Siaven P. Mest (hepartment of farth, Atmospheric, and
Olessiary Catacat, Mansschaestis institute of
fachnofogy, Imbridge, M. Mel'Ni and A.K. Burdy
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rurinhility of 0.5 m.y. eld trust in the ROST area of
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seed on the modelling of anyiltade patterns of rengen of
to 19 has and on componisms with the apper crust
sampled at 1900 hale 5048 and in ophicilite complexy,
layer F can be divided lato three anits; 46 corresponds
to astruting voicenics with a team welgely gradient, 50
to a complex region of trunsilism from artrusives in
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ditam to isotropic gabhors within layer to the
variability of these two anglitude patterns provided
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F. Geophys. Ren., 3, Papar 48550 Lrevel-time information. I. Geophys. Zen., 5, Paper 485450

6970 Structure of the Crust and Apper Mantle GROLOGIC AND SHISHIC VELOCITY GRAPTAIRS OF THE CROST/AUANTE TRANSITION IN THE RAY OF ISLANDE SPRISLIFE COMPLEX
J.A. KERSON (Department of Geology end Geophysics, WEGI, Woode Role, MA 023631, J.A. Criffee and J.F.

Georgical insestigations of the Bay of Jelenda Ophiolira Complee show that while a typical layered ophiolira Complee show that while a typical layered ophiolira solita is possent, the thickness of major inhologic units is extremely veriable from place to place. The temposition and lotarnal structure of sep-scate (kilometers across) lithuings units as mail as the contact that bound them are infarrelly variable. Infarred valuality-dayth functions of the crust/mantle ('MONIO') transition resonatructed for this terrange as seemed lithuinghers suggest on seffencelly couples internal estructure. The arust/mantle freesition from mafic to ultramafic lithuingian varies across the ophiotics from a sharp ithologies wartes across the ophicitie from a therp geologie and estante welcelty discontinuity to e complexity later apered transition some on much as I has thick. The maffe/ulframefre transition is units on the order of hundreds of meters to a faw bilometers filled and up to several bitameters long. These units (expelsees) may be composed of lithologies with higher or lower saims welcathes theo these of the surrounding anits. Solid-state deformation has produced seisminstly solestropic asterial in the upper mantle and tower crustal soles. Subsectatial relief and slopes of up to at least it degrees over interest distances of shout IO he sour on the top of the organization come se

J. Grophys. Res., D. Paper 480322 Social Sciences

7390 Generol (Reservoir Management)
A DESCRIPTIVE DECISION PROCESS NODEL FOR HIERARCHICAL MANASEMENT OF ISTERCOMMECTED SESERVOIR SYSTEMS
R. Hiter Adaptact and Osman Contunolity (Department of Operal Engineering, University of Illevia, Urbane, illinois, 61001)
A significant Himitation of prescriptive optimisation models is that their formulation is dissociated from the behavioral ond organizational etiribulas of the problem addressed. In an ettempt to alleviate this limitation, a decision process model is formulated directly within a framework of decision speaks involved in integrated loop, and short-term plusning and management of builtipurpose and multireservoir system operations. This resulting model is hierarchical, multileval, multilevar, and integrated loop, and short-term plusning and management of builtipurpose and multireservoir system operations. This resulting model is hierarchical, multileval, multileval,